Bender Hygienic Laboratory—
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BENDER HYGIENIC LABORATORY.

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The Dedication of the Bender Hygienic Labaratory.

The Bender Hygienic Laboratory was dedicated on Tuesday, October twenty-seventh, 1896.

The building itself, a picture of which is contained in this number, was presented by Matthew W. Bender, Esq.

The Park Commissioners of the City of Albany allowed the building to be erected on land devoted to public usage; and the faculty of the Albany Medical College, by a unanimous vote, contributed their salaries, as teachers in the Medical College, for the coming year, for the purchase of the entire scientific apparatus.

The equipped institution thus represents: The generosity of a public spirited citizen, the wise foresight of the municipality, and the self denial of the physicians connected with the Albany Medical College.

That the enterprise thus worthily founded may be a model and example to other institutions throughout the land, and be a stimulous and incentive to generous gifts of patriotic minds, and that it may continually contribute to the advancement and dissemination of scientific medical knowledge, and to the prevention and spread of disease and death, is the earnest hope of the entire community.

The order of exercises, together with the speeches made on the occasion of the dedication of the building is as follows:

Prayer by Rev. J. Livingston Reese, D. D.; History of the building by Geo. E. Gorham, M. D.; Formal presentation of the building to the board of Trustees by Harry H. Bender; Reception of the building on behalf of the Board of Trustees by A. Vander Veer, M. D., Regent of the University of the State of New York; Address by Prof. B. Jacobi, M, D., of New York; Benediction by Rev. Freeborn B. Jewett, Jr.; Inspection of the building.

History of the Building, by Geo. E. Gorham, M. D.

Mr. Chairman and Gentlemen:—Twelve months ago the first foundation stone of the Bender Hygienic Laboratory was laid; less than twelve weeks ago the sound of the hammer and the swing of the brush were yet within these walls; therefore, the history of the building is a brief one. Brief though it be, it gives me pleasure to relate it.

Pleasure, because to erect such a building, for such a purpose, is an honor to our city, a credit to our state. Pleasure, because to our State Normal College, the Albany Medical College, the Albany Law School, and our other well known institutions of learning, we add to-day the Bender Hygienic Laboratory, and institute here a course of instruction and scientific research in pathology, bacteriology and the allied medical studies, emphasizing again the fact that as a progressive educational centre Albany ranks with the first in this country. It also gives me pleasure to state that this, the latest accession to our educational institutions, comes to Albany through the generous gift of her esteemed citizen, my friend and neighbor, Mr. Matthew W. Bender.

About two years ago, knowing something of Mr. Bender's unostentatious contributions to charities, I mentioned to him Albany's need for better hospitals; later, at the suggestion of Dr. Vander Veer, I presented for his consideration the idea of building a Laboratary for pathological and bacteriological work. Mr. Bender promptly offered to give $20,000 to erect such a building upon the condition that a suitable site be provided him.

On the evening of June 27th, 1895, Dr. Albert Vander Veer, Dr. Henry Hun, Mr. Robert Scherer and George E. Gorham, met with Mr. Bender and for the purpose of carrying out his wishes, organized the Board of Trustees of the Bender Hygienic Laboratory. The Board immediately applied to the Park Commissioners, and through their generous action the desirable site and grounds now occupied by the building on Lake avenue were obtained. Messrs. Fuller and Wheeler were employed to prepare plans for the building, and, at the next meeting of the Board, July 12th, the plans were accepted. August 5th, 1895, bids for the work were examined by the Board and contracts awarded to the following Albany contractors: Masonry, Stephen A. Carr; carpenter work, Morris L. Rider; painting and glazing, David R. Stewart; steamfitting, P. J. Sweeney; plumbing, Ridgeway & Russ; roofing, James Ackroyd; Mosaic tiling, the Schilling Co.; corner stone, Flagler & Chapman; gas fixtures, Van Heusen Charles Co.; seating, W. A. Choate Co.; elevator, Sedgewick Machine Co., of New York City.

Under the supervision of the contractors the work has gone steadily forward to the state of completion in which you see the building to-day. The Mosaic tiling, the seating, elevator, and a few other extras not included in the first contract, have been added by Mr. Bender at a cost of one thousand five hundred dollars in addition to the twenty thousand originally donated.

Dr: Geo. Blumer, late of Johns Hopkins University, is director of the Laboratory, and under his directions the class rooms, amphitheatre, etc., have been fully equipped with necessary apparatus, Eighty-five microscopes, tables, lockers, thermostats, hot air and steam sterilizers, freezing apparatus, microtomes, etc., have been placed in the different departments. This generous outlay, together with the salary of the director is furnished by that tireless corps of public spirited aud unselfish workers, the faculty of the Albany Medical College.

Formal Presentation of the Building to the Board of Trustees by Harry H. Bender in the Name of the Donor, Mr. Matthew H. Bender.

In attempting to perform the delicate but pleasant task which devolves upon me at this time, I am deeply impressed with the disparity between the importance of the occasion and my own small measure of ability to do it justice. I cannot hope to put in adequate language the sense of gratification and personal compliment I feel in being thus chosen the humble instrument to formally symbolize, in this public manner, the consumation of a project the practical realization of which began on the 31st day of October, 1895, when I witnessed with parental pride the laying of the corner-stone of this edifice by the boyish hands of my son, Kenneth Everts Bender—a project which I believe is fraught with the possibilities of wonderful achievement in the science of medicine and untold blessings to mankind. I can only assure you of my enthusiastic sympathy with the philanthropic and humanitarian motives which actuated the donor in his conception of this gift, the singleness of purpose with which he has furthered its development, and the broad and liberal spirit of professional enterprise which has been his inspiration and encouragement at all stages of the undertaking, and which now prompts you, gentlemen, to receive from him the responsibilities and opportunities accompanying its bestowal which only the future can unfold.

I deem it one of the greatest privileges of my life to have been connected in an executive capacity with this work. While I have at

all times felt the weight of my responsibilities, and have not been free from care and anxiety as it progressed, yet I am happy to say that on all occasions I have been animated by the spirit of hearty and cordial co-operation which has been uniformly accorded me by the medical profession into whose capable hands I now commit the fruit of our united labor.

It is not, perhaps, fitting that I should dwell upon the nobility of the mind, the virtues of the heart, the generosity of the hand, which called our efforts into being, and ever stood back of and upholding us all, never failing in any crisis or emergency to furnish that moral and material support without which our exertions would have been unavailing. But I trust I am not debarred by family ties from telling you how proud I feel to-night that the modest and unassuming gentleman who has been and is the heart and soul of this undertaking—to whom is due the gratitude not only of this corporation and the medical profession, not only of the thousands of students of the Albany Medical College who will receive substantial aid here, not only of our day and generation, but of the unnumbered posterity which in after years shall rise up and call him blessed—bears the name of Bender. I cannot leave wholly to other lips the praise that is due to him who by his works has proved himself to be humanity's benefactor, and who has so signally honored me with his confidence in the carrying out of his high-minded charity.

Reception of the Building on behalf of the Board of Trustees, by A. Vander Veer, M. D., Regent of the University of the State of New York.

My dear Mr. Bender:—In accepting the noble gift you have this day donated to science, in behalf of the Board of Trustees of the Bender Hygienic Laboratory, and of the faculty of the Albany Medical College, I desire to express to you our earnest thanks and gratitude.

The conception and object has been so well presented by Dr. Gorham, and by your nephew, Mr. Harry H. Bender, that I can add but little in commemoration of this great event.

Within a few days of one year ago we stood upon the foundation structure of this building, and with proper ceremonies assisted in laying the corner stone. It was my privilege at that time to address you with such remarks as the occasion called for, and in a few brief sentences I alluded to the possibilities that the building of this Laboratory might bring in the "lengthening of human life and the alleviation of human suffering."

Had I the power of expression, and did time permit, I would be glad to dilate upon these points, and express to you more fully the thoughts of respect and admiration that exists in the minds of the Trustees and those who are hereafter to be associated with the administration of this building towards yourself; for the nobleness of purpose, for the grandeur of the act that is now consumated, in giving so elegant a structure for future investigation of the causes and study of diseased conditions of the human system. We all rejoice that your life has been spared, and that we have you with us to-night, that you may witness the dedication of your own good work.

A wise man towards the close of his life once said, "All that I have spent upon myself is gone forever; all that I have saved I must soon leave to others, but whether it shall be a blessing to them I know not."

To this may be added that, in the closing period of your life, you may justly say that "the work I have here done will be constantly witnessed and enjoyed with a wonderfully cumulative quality."

What a blessed thing to have been able to accomplish so much, and to be permitted to witness somewhat the good results that are to follow!

Who can deny but that with the director and his assistants of this Bender Hygienic Laboratory, we may not yet see larger investigations in tuberculosis that is to result in the saving of life; or that in the study of septic peritonitis we are yet to know something more as to the deadly effect of the ptomaines and conditions that result so rapidly in death; or that we may not learn something that will tell us of the true nature of cancer and the possibilities of its treatment; or that in the continued investigation of water supplies, and of the isolation of the bacillus of typhoid fever, we are not to learn something more saving in the treatment of this disease; that we are not to profit by investigation as to the contagious and infectious diseases, as scarlet fever, diphtheria, etc., the true nature of the so-called milk disease, the better treatment of such acute attacks or conditions as present in poisonous ice cream, and many forms of diseased food, and something more to be learned as regards the possibilities and uses of the antitoxines? Who can deny that it is not among the possibilities that in the future here may be discovered and demonstrated the antitoxin that is to be used against the venom of all snake bites?

Within your memory you have witnessed epidemics that have visited Albany and claimed its many victims in the grasp of death; you have seen the effort made to build a high fence to shut out the dreaded cholera, and it ought now, in the erection of this grand struc-

ture, to be a comfort to you to know that in it may be established a bulwark of strength to keep at bay the most virulent epidemic.

You, and all of us know this to be true, that in the investigations made by bacteriologists, enabled by such generosity as yours to conduct earnest research, we have learned that cholera is a distinct germ, and that this very bacteriological study has established a line of treatment so beneficial that to-day, among intelligent and well educated people, there is little in the disease to be feared.

Consider for one moment some of the epidemics that cause so much anxiety among our farmers in certain sections, i. e., hog cholera, a disease of such fatal character, or another called Texas fever among cattle, or chicken cholera, how thoroughly well these conditions have been followed out, brought to their true origin in a microbe, that tells in itself the line of protection and necessary treatment. These are, of the list, a mere reference, a foretaste of the many possibilities of the work that may be done here in the future.

In assuming the responsibility that rests upon us as Trustees, in taking charge of the building, we appreciate the generous gift made by you in the cause of science, and that you have completed here an edifice that is suited in every way better than some far more pretentious and expensive for the work at hand; that you have done more than you really promised at first in its construction. But we also realize that we are greatly indebted to the Faculty of the Albany Medical College for the rich and modern equipment of apparatus, that is up to date in every respect, aiding so clearly to complete the plant as a whole. We also realize that for the maintenance of the work it is intended shall be done here, the Faculty of the College has assumed much, but we trust that the same public generous spirit that stimulated you in fulfilling your promise may, through new, earnest friends, bring us an endowment, or in some manner aid in continuing the work so well begun.

To you, Mr. Bender, I am sure I convey the feelings of the Board of Trustees in rendering you our earnest gratitude, and in expressing in behalf of the Faculty of the Albany Medical College, its students, and members of the profession in this city and surrounding country, the wish that God may lengthen your years, and that your declining days may be peaceful and serene.

It is not my intention to dwell further upon the possibilities or the good that is to come from the work inaugurated here.

We have with us to-night one who leads in the noble path of science, one whose reputation is not alone of this continent, but the entire world. It may be said of him that he has done his work so well that it reaches to the North, South, East and West,—one whose repu-

tation for professional work has few equals—one whose name is known by thousands, and in thousands of the homes of his adopted country.

Therefore, I can say with all candor that it gives me great joy and thankfulness to be able to introduce to you, as the orator of the evening, Professor A. Jacobi, of New York City.

Address by A. Jacobi, M. D., of New York.

The earnest spirit exhibited in the arrangement of this celebration, the concourse of students, the participation of medical practitioners of this city and from beyond the boundary lines of Albany, the gathering of gentlemen not directly connected with our profession, the presence of a stranger upon whom you have conferred the honor of an invitation to address you, and the interest shown in your achievement both by the public and the press—all this seems to demonstrate that this occasion is felt by all to be one of more than temporary or local importance. This is as it should be, for of all the institutions of learning and research none can be more worthy of the sympathy of all classes than a laboratory of hygiene.

Hygiene is that part of medical science and art which treats of the causes and prevention of disease. We can not conceive of a subject of vaster importance and more incompatible with ignorance. It ought to be understood by every man to whom is entrusted the care of the individual or of the community, for it comprehends, as you will understand if you will but run your eyes over the index of any text-book on that subject, a great many vital topics. To it belong the normal and abnormal conditions of air, water, foods, and soil; the removal of sewage, the construction and sanitation of dwellings, hospitals, schools, manufactories, camps, arsenals and prisons; and the subject of baths and bathing, of clothing and exercise. The theory of disease germs and of contagion and infection, with the history of epidemic diseases and the disposal of the dead, prevention and treatment by antiseptics, disinfectants and deodorizers, and protection by quarantine, and finally, vital statistics form intrinsic constituents of hygiene.

You have noticed that the themes I enumerated are, so to speak, no mere primary elements of medical science or art. Indeed, they require the application of a number of branches which must be taught and learned before the difficult matter of hygiene can be fully grasped. It is mainly physics, chemistry, physiology, pathology and bacteriology which form the foundation of the structure, and ought to be thoroughly assimilated by the student's mind before he may expect to master

hygiene. It is, therefore, impossible to believe that the undergraduate will, in the second or third year of his medical curriculum, succeed in acquiring a knowledge of it any more than he can expect to become a diagnostician without anatomy and physiology, and without patients. The addition of a fourth year to the course of medical study, such as your college has established, is therefore indispensable. To it mostly belongs the instruction in hygiene which, based as it is upon previous studies extending over three years, must be twofold.

Didactic lectures and the study of books will convey much information, but without practical laboratory work, neither teacher nor student will succeed any better than the chemist without personal experimentation, the anatomist without dissecting, or the swimmer without water. Now, the significance of hygiene for the physician, the layman and the community at large is such as to preclude the possibility of a college with a two or three years course being able to supply a modern public with modern physicians. The profession has waked up to this knowledge some time ago; indeed, it has been the profession that was the principal agitator in behalf of progress. Your city of Albany has been a lively battlefield in the war of evolution. Those under whose leadership we have been struggling for the improvement of medical instruction and the extension of legal requirements these two dozen years will admit that the profession of the empire state had now and then to overcome serious obstacles coming even from some of the colleges. It is both with gratification and gratitude, however, that I remember the active and incessant aid lent to the cause of progress by the Albany Medical College. To-day both the profession and the colleges appear to work for the same ends, namely, the better preparation of matriculants, more years of instruction, longer courses, more branches and more teachers, every one of whom should be a thorough specialist—not necessarily in practice, but in the branch he means to teach—, and besides: practical work in laboratories.

These are demands not always made either in America or Europe. The briefest possible retrospect of the condition of medical knowledge and practice, and of teaching methods, and a comparison of periods not so very remote indeed should as well emancipate us from desponding pecsimism as justify some optimistic hope for the future. Of our present status I do not speak, for to intellectual enterprise there is no greater drawback than self-sufficiency and the beatitute of self-congratulation. No medical period can ever afford to boast of its own perfection.

Fifty years before I started to study medicine, say about 1800, medical science and art furnished many illustrious names. There were

Hunter, Haller, Bichat, Peter Frank. But teaching and practicing were comparatively on a low level. Most medical schools or medical faculties of universities were limited in anatomical material, practical instruction or clinical teaching. Often the same person would teach botany, obstetrics and theory and practice, or anatomy and materia medica. Aye, now and then there was one who would write books on philology and on medicine; still there was an advance, in spite of the mysticism in which the medicine of Germany was, it seemed, hopelessly immerged; for the empirical tendency and cool observation of the Anglo Saxons never wavered, and the French kept the flag of scientific anatomy, physiology and nosology unfurled in the first half of the century.

Fifty years ago when I was considerably younger than to-day, and began the study of medicine on which I continue to be engaged at the present time, Virchow had just commenced his war against ontology, and laid the foundation of cellular pathology. Still, the differential diagnosis of what has been called Bright's disease had begun to be elaborated but twenty years previously. The stethoscope was not twenty years old, and my old professor at Bonn, Friedrich Nasse, then three score and ten years old, was one of the few who appreciated and enthusiastically taught on German soil this French innovation. In Goettingen I had an illustrious teacher who was at the same time professor of anatomy and dissected with us, and of operative surgery and director of the surgical clinic. In all Germany outside of Vienna, which at that time was part of Germany, there were but two places where pathological anatomy and histology were taught, and but two men who gave such instruction, namely, Virchow in Würzburg, and Frerichs in Goettingen. That is why I travelled four hundred miles to the latter place. In a New York institution I was, some thirty or thirty-five years ago, connected with a surgical gentleman of knowledge, enterprise, skill and fame, whose proudest possession was a large, splendid, gorgeous, velvet gown, which covered him all over to his feet, and made a tremendous impression on the spectators while he was operating on the dead or the living; he attended to both, sometimes in the same hour and on the same table in the amphitheatre. Now and then he would perform the same operation, first on the cadaver and immediately afterward on a patient. It was not very hygienic, but at that time it was strictly legitimate. A hospital and a dissecting room were under the same roof. That was but little more than thirty years ago, and few of us knew or taught better. A short twenty-five years ago we had in connection with wounds no higher ambition than to see pus. If there was none we might have, and too often had, erysipelas or gangrene. Pus was always looked for and welcomed if it

was but "bonum et laudabile". When I was a student there was no laboratory anywhere but the chemical. It was at that time that Pettenkofer began in private his influential studies on topics connected with hygiene, but it took decades before he succeeded, in 1878, in obtaining an official laboratory. Still, from him and his time date the appreciation of the theoretical and practical importance of hygiene as a science. I may state the gradual effects of his personal and local efforts right here. It was from that period that the sanitation of Munich became possible. It resulted in the extermination of typhoid fever which had decimated both the home population and the strangers. It spread health and vigor over old and young, while embarrassing the mourning goods stores and the undertakers.

In recalling these historical facts and personal reminiscences, let me not forget, however, that within that time great achievements were accomplished even without the modern methods of work and study. Although there were no laboratories, and no high-power microscopes, no Abbe condensers and no oil immersions, there was what no great metropolitan teacher nor obscure country practitioner should be without —educated brains, powers of observation and application, and common sense. Within that very time, a century ago, Jenner had introduced vaccination, and one-third of a century ago the United States improved hospital arrangements. It is our pride as a nation, and always should be, to remember that America has been foremost in accomplishing the greatest practical progress almost without any schooling. I can do no better for you than to copy, in order to make clear what I mean to say, literally from our great pathfinder and master, Rudolf Virchow. In his "Progress of Military Medicine," an oration delivered on August 2nd, 1874, he says: "The French army lost in the Crimean war 33% of its men, namely 95.615. Of this number 10,240 were killed on the battlefields, and about as many died of their wounds in the hospitals. More than 75,000 men died of infectious diseases. In the American civil war 97,000 died of their wounds and 194,000 perished of infectious and other diseases. What a vast amount of pain and misery! What an ocean of blood and tears, and besides what a number of errors, mistakes and prejudices! It is not necessary to now enumerate the long list of blunders and sins. They are so well known as to serve in the future as warning examples. Let me say here that it was not misfortune alone that showed where the cause of evil was and then provided aid. If the French learned little or nothing in the Crimea, and the Americans so much in their civil war as to create a new era in military medicine, the explanation is not to be sought for in the immensity of misfortune and misery undergone by the Americans, for they did not

suffer any more than the French did in the Crimea. The explanation is in the critical and thoroughly scientific spirit, the clear perception, the sound and practical common sense which penetrated gradually every part of the American military administration, and which with the astounding coöperation of the entire nation accomplished more humane results than any great war ever produced before. Whoever studies the copious publications of the medical staff of the American army must again and again be astonished at the vast experience collected in them. Absolute accuracy of details, the most painstaking statistics, acquaintance with all branches of medical learning, and a comprehensive style are united in them for the purpose of collecting and preserving in the interests of the present and future generations the new knowledge so dearly bought."

The practical results of the civil war were the pavilion system, the increase of air space, the isolation of contagious diseases, the improvement of heating and ventilation, and thereby a vast saving of lives. The lessons were not lost; were learned and adopted all over the globe, and made the American name honored and blessed all over the world. Understand, young men, for the present and the future, that this is the only practical and useful sort of interference with European nations which is worthy of the American people and consistent with the principles of our government.

While almost instinctively we succeeded in finding some way of escape from deadly diseases, the Europeans advanced slowly and surely to the evolvement of what first appeared theoretical science only, but proved of vast practical import. These two, as a rule, go hand in hand. It is true science that has its own reward in satisfying the mind, but I know of no instance in the history of mental development but demonstrates the fact that the most theoretical, the most abstruse intellectual result will always turn out to be serviceable to mankind. Of this there is no more beneficent instance than the methods by which the sources of disease have been fathomed. By the study and knowledge of their causes the greatest improvements have been made in the prevention and treatment of epidemic diseases. There was a time when they were unexplained in their suddenness and considered unavoidable. Niobe and her nine children slain by Apollo and Diana are always sad realities. There have been millions like them, though they alone live forever in marble and prove that the highest degree of æsthetic and artistic achievement may well accompany dense ignorance. That may occur in nations as it does in individuals. In heathen antiquity and Christian mediaevalism disease and death are deemed punishments. There is no way of combating them; mute submis-

sion only is demanded. Nothing is indicated but prayers, offerings of beast or man, and pilgrimages. There was another time when nothing bad could happen except through some evil influence. Somebody was at fault when a cow or a child died. There was witchcraft or the evil eye. When there was a general dying somebody must be killed for it —dissenting protestants by the hundreds, Jews by the ten thousands.

There was a later period when it was neither gods who sent their swift arrows nor Jews who poisoned the wells; when it was well known that epidemics would follow in the path of wars and thus depopulate the large cities; that they would spread from man to man and thus decimate the people. The latter belief was even exaggerated when it was found advisable to class syphilis also among those diseases which could be transmitted without physical contact, for nothing is more pleasing to human self-love than to escape, not so much guilt as the appearance of guilt. Thus it was felt that in the dissemination of contagious diseases there must be a something the nature of which was unknown or unknowable. The "genius epidemicus", the epidemic tendency, was the pass-word which allowed etiology to go unchallenged. By others, though they admitted not to know the nature of the contagion, the latter was believed to originate in the body, at least in some instances, spontaneously. Typhoid fever, tuberculosis, dysentery were thus explained. By many, spontaneous generation of the cause of the disease was assumed for the generality of cases; by others, for the first instances of the epidemic only, but no matter whether the real cause was hidden there were the facts of contagion and of awful mortality; and the clear head of the eighteenth century—Sydenham in England, Boerhaave in Holland, Van Swieten in Holland and Austria, Peter Frank in Italy and Austria—knew better than to cross their arms in such nihilistic contemplation, as reigned supreme through a protracted period of this very century of science and humanitarianism. Many of the measures established at present on solid knowledge and improved by experimental research were inaugurated by them. Their reasoning was as follows: Man is the carrier of contagion; therefore, when falling sick with a contagious disease he must be isolated. A contagium will not cling to everybody indiscriminately. Thus the amount of individual vulnerability appears to be larger or smaller, but no matter how various the degrees, there is *some* vulnerability probably in everybody. Therefore, try to diminish it by saturating the system with the poison when the epidemic is mildest. Thus they inoculated variola and risked a slight danger rather than allow men to die of a greater. And thirdly, no matter whether the nature of the contagion is clearly known, it is advisable to destroy or diminish its poison. As

early as the period of black death in the fourteenth century people would keep wood and tar fires burning in the streets. Was it the instinctive belief in the disinfectant action of heat, of tar, and of creasote?

Afterwards fumigations with vinegar, with chlorine, nitrous acid, were resorted to. Patients and utensils had to submit to disinfection as best they could, and goods or tools were either burned or temporarily buried.

The organic origin of disease (which was to be proven after manifold labors) was first suspected in antiquity when imagination gathered all the visible and alleged invisible insects under the sinister command of the supernatural patron, the devil. Amongst the Romans, Varro suggested the presence, like that of big insects, of invisible minute beings hovering over swamps which he thought might cause fevers. Paracelsus when speaking of the seed of diseases may have believed in a similar hypothesis. A clergyman, the Jesuit Anastasius Kircher, 1671, was the first, however, to claim contagion to be the result of organic influences, and Leuwenhoek being in possession of a better instrument made by himself, was the first to discover real bacteria.*

Progress. however, was slow. It took a century until O. F. Müller, 1786, was able to describe and draw some of them. The names given by him are still in use. Bory de St. Vincent in 1824, Ehrenberg in 1838, Dujardin in 1841, added a great deal to our knowledge. In my own time Perty, in 1852, discovered the changes which take place in bacteria when developed under varying circumstances, and in 1853 Ferdinand Cohn classified, rather pedantically, it is true, the whole number of microbes then known.

Kircher's theory of the organic origin of disease was adopted by Lancisi, Reaumur and Linné. Its firmest believers were Marcus Antonius Plenciz whose book of 1762, and Pringle whose researches on infectious diseases and disinfectants furnish the best presentation of the subject in the last century. Their views, as Ferdinand Hueppe aptly remarks, were, however, not generally held because it was not so much the *cause* of the disease as the disease itself that was considered to be a living parasite; for it is from that time that such names date as lupus and cancer, which have outlived their justifiable term of existence. Besides, positive knowledge based on descriptive observation was defective to such an extent that even Malpighi, Morgagni, Bichat, and

*J Ferdinand Hueppe, Naturwissens chaftliche Einführung in die Bakteriologie, 1896. Friedrich Loeffler, über die Fortschritte in der Bekämpfung der Jnfektions Krankheiten in den lezten 25 Jahren, 1896. Max Gruber, Pasteur's Lebenswerk, etc., 1896. Charcot, Bouchard, Brissaud Traité de Médecine, Vol. 1, 1891. G. M. Sternberg, A Manual of Bacteriology, 1892. Victor C. Vaughan and Frederick G. Novy, Ptomains, Leucomains, Toxins and Antitoxins, 3d Ed., 1896.

up to 1874 Virchow, gave their attention exclusively to the pathological anatomy of organs and tissues.

At that time, however, the question of the nature of putrefaction engaged the attention of many minds. Decomposition was proved to be organic in yeast by Astier in 1813; the so-called "bleeding hosts" were demonstrated by Sette in 1816 to owe their discoloration to bacteria. In 1837 Cagniard Latour studied the yeast deposits which he found during alcoholic fermentation. He proved them to be organic, and presumed they were the *cause* of fermentation. In the same year Schwann became more positive of this, and moreover found that extract of nux vomica did not stop fermentation, but that arsenic did. This is why he took it to be of vegetable nature. The same results were obtained by Turpin in 1838. Fuchs in 1841, Remak in the same year, and in 1843 Mitscherlich referred all fermentation to living microbes. The two last named authors were the first to find *two different microbes in two different forms of fermentation.* Helmholtz also participated in these researches without, however, excelling here as he did in almost everything else he undertook. It was only in 1857, however, that Pasteur could prove undeniably, in spite of Hiller's and others' remonstrations, that *all putrefaction and fermentation were attributable to microbes*, and that *each different fermentation had its own specific organic cause.*

Long before researches on the origin of the diseases of animals, Provost found in 1807, and deBary after him, the causes of diseases of plants to be microbic. Bassi and Balsamo discovered in 1835 the microbe of the "muscadine" disease of the silkworm, and Audouin the spores which enable the parasite to live through the winter. Schoenlein found the achorion to be the cause of tinea, Simon the acarus of the itch. It was shortly before this time that Henle, in 1840, formulated his conviction that infectious and contagious diseases were the result of living causes. His main reasons were these, that in such cases the morbid matter was evidently increasing from the moment of invasion. Organisms only have that faculty. Another reason was this, that the quantity of the invading material was out of proportion to the effects gradually obtained by it. Further, that there was a stage of incubation which was not required in poisoning by a definite dose of a simple chemical substance, and lastly, that the poison which is introduced in a very small quantity must increase before the disease can be expected to make its appearance.

Henle's theory suggested by the facts hitherto known, and supported by the published reports of Franz Schulze in 1836, and Schwann in 1837, was confirmed by Schroeder and von Dusch, 1854

and '61, by von der Broek, 1857, and by Pasteur. Pasteur having established as a sound fact the principle, *omne vivum ex vivo*—that is, nothing that is alive can possibly have come from what is dead—, and thereby annihilated the doctrine of spontaneous generation, and having further found that fermentation and putrefaction took place through external microbic influences only, Joseph Lister concluded that if wounds became infected through such living external influences only the latter should be kept away from them before they could reach them, or be destroyed. That was in 1867.

There was great activity in the study of bacteria from 1866 to 1876. Klebs found microbes in pyonephritis in 1866, Rindfleisch in pyæmia in 1856; soon after Recklinghausen and Waldeyer in metastatic abscesses, Klebs in gunshot wounds in 1872, others found them in septicæmia, erysipelas, hospital gangrene, puerperal fever, diphtheria, and finally, 1873, Obermeier in relapsing fever. In this way much valuable material was collected, but unfortunately but little sifted. It so happened that in similar conditions many varieties were found to occur simultaneously, by several in abscesses, also in diphtheria, in cholera, in variola. Pasteur found a number of bacteria in putrid material, but in most cases no positive decision was at that time arrived at as to the relationship of specific microbes or poisons to specific diseases. Besides, there was never such a scramble for notoriety as in those times. Dilettanti in journalism were as numerous as pickpockets at a fair or tramps after a battle. The medical weeklies and monthlies of that time teemed with new discoveries and new bacteria. Bacteria found in the dead body were proclaimed to be the cause of death, accidental finds the origin of a special disease; and hundreds of essays appeared at that time which proved nothing but carelessness in experiment or observation. Thus it could happen that even all the results obtained by one of the most active and ingenious experimenters, Hallier, could be proven by deBary to be worthless, because no protection had been procured against the accidental admixture of miscellaneous bacteria. At that time it took a great deal of mental equilibrium not to be swamped by the flood of new microbes. Indeed, in spite of the results already attained and appreciated, the profusion of immature publications was enough to create doubts and prejudices in the minds of many clinicians. It was at that time, in 1880, when finishing my treatise on diphtheria that I availed myself of that occasion to express my own feelings about the hasty and immature conclusions arrived at by the crowd of microscope fiends and leaned in the explanation of the diphtheritic process rather to a chemical poison than to the direct influence of a parasite. Riper experience, all built up on laboratory work, has since taught us that in

diphtheria as well as, with but few exceptions, in every infectious disease in whose development microbes are known to be concerned, it is a chemical product of the microbe only which penetrates into the circulation and destroys life. It is fortunate indeed that it should be so, for chemical poisons are more easily counteracted than living microbes circulating in the blood. The latter condition is present in anthrax. That is why Pasteur's inoculation of thousands of flocks of sheep with less virulent anthrax has not proved an unmitigated success. Deaths have taken place after such inoculations as they did when in the last century smallpox was inoculated to protect against smallpox. In southern Russia in such attempts at conveying protection thousands of sheep were destroyed. When speaking of this accident it was Haffkin, of whom I shall have more to say, who, shuddering, exclaimed, "If that happened to man!"

After many mistakes, amongst which one of the most prominent is the alleged isolation of Bergmann's "sepsin", Panum proved that *septic poisons could be derived from microbes*, after Coze and Feltz in 1866, and Burdon Sanderson, and in 1872 Davaine had succeeded in perpetuating infectious processes by persistent inoculations of the same microbes from animal to animal. As early as 1868 glanders had been produced by vaccinating its pus, and it was proved by the effects of immense dilution that the infecting material must necessarily be of organic nature. Still, the nature and manner of propagation of the microbe was not recognized. Finally in 1876 Koch discovered that the great vitality of the bacilli of anthrax, themselves very perishable, owed their vitality to the formation of spores.

Thus far the parasitic theory appeared to be rather firmly established, but still, as many believed in the excessive variability of bacteria, and attributed their many different forms to transmutation of a single original form, they were often believed to be not the *cause* but the *accompaniment* of the infectious process. All this happened in spite of the fact that Pasteur had differentiated the bacteria of wine and of beer fermentation, of anthrax, of sarcina, of amylobacter, and Obermeyer's specific spirilum of relapsing fever was known since he paid his self-sacrificing zeal with his own life. Another proof of the essential differences of bacteria was accidentally found by Schroeter who noticed differences in the color of his cultures, but a scientific differentiation became possible only when C. Weigert and later on Ehrich taught the systematic staining of bacteria by means of basic anilin dyes. With this method and better microscopes, and immersion, and the use of Abbe's condenser, Koch made rapid strides. In 1877 he published his treatise on the methods of research, and in 1878 the etiology of the

infection of wounds. About the same time Pasteur, 1877, after having proved in 1863 that normal blood was free of germs, demonstrated that the bacillus of anthrax would grow not only in the circulating blood, but also in blood outside the body and on other nutrients. Thus prepared, he and his pupils discovered a number of characteristic microbes: that of malignant œdema in 1877, the staphylococcus pyogenes in '78. that of the sputum-septicæmia, identical with the pneumococcus of Fraenkel, in '80, of chicken cholera in '89, of hog cholera in '82. Lister, Buchner, and Koch further improved the methods of examination until in 1882 the latter succeeded in demonstrating his bacillus of tuberculosis before the physiological society of Berlin. At this time it was conclusively proven that the microbes had each their peculiar etiological significance, that in fact it was a *single specific microbe which caused a single specific infection or contagious disease.*

Let me here try to correct what I believe to be a mistake and to give rise to confusion. The terms contagion and infection are too often used promiscuously, though they are by no means synonymous. The dissemination of mycotic diseases takes place in different ways. There are those which can not be communicated from person to person, but spread only by the microbic cause invading the individual. To this class belong malarial fevers produced by plasmodia. Malaria is not contagious; just so in all probability cerebro-spinal meningitis. There are, secondly, those which are not communicable from person to person but through external carriers only, such as soil, water, food, air, clothing and utensils. To that class belong yellow fever and Asiatic cholera. They are infectious. There are, finally, those which may be transmitted directly from a person, or indirectly through carriers. To this class belong scarlet fever, measles, diphtheria, variola, influenza, erysipelas and varicella, perhaps also whooping cough. They are contagious and infectious. As its cause has not been sufficiently proven to be microbic, I do not add syphilis. On no account, therefore, ought the terms contagion and infection be taken as synonymous.

The belief of Naegeli that the multiplicity of bacteria originated in a single or a few changeable varieties was proven to be erroneous partly by direct observation and partly by the results of cultures undertaken under varying circumstances, It can be demonstrated that the infectiousness of bacteria may be increased or lowered. That is what Buchner found in 1880 in regard to the bacillus of anthrax. The main progress in the following years was made by Pasteur either single handed or in coöperation with his pupils. In 1880 he found accidentally that the bacillus of chicken cholera was less virulent when the cultures were exposed to air and got cool. Still, the hens infected

with them became ill. After they recovered he infected them with thoroughly virulent germs, and, lo and behold! they were immune. From *that time dates all our modern protective and curative therapeutics of infectious diseases.* Pasteur then experimented with anthrax. A few of his results can be stated in the following brief sentences. The bacillus of anthrax did not develop in the blood of the living chicken. That is, the latter were immune against anthrax. But the bacilli *did* develop in the blood of chickens outside their bodies. The conclusion was that the presence of bacilli in the animal body was active or inactive, not *through its own properties, but only so far as the animal tissues permit of its influence.* The disease, therefore, is not established by the presence of the bacillus, but is the composite of the symptoms caused by the battle of the invader with the living cell.

Pasteur also found that the infected chick remained immune when retaining its own high temperature. When it was cooled by being immersed in water it fell sick, but recovered when again warmed. The conclusion is that the development and growth and injuriousness of bacilli, or some of them, depend on the *temperature of the medium* in which they are. He further found that the bacillus of anthrax grew in sterile urine when being alone in the fluid, but not when other bacilli were exposed together with it. This observation was confirmed by further experiments. When these bacilli were injected with other bacilli into an animal, the bacilli of anthrax did not thrive, and the animal remained well and alive. The discoveries followed one another in quick succession. Septic phlegmonous suppurative processes of all kinds were found to be caused by different bacilli. On the other hand, the same *microbe would cause different affections in different animals.* The bacillus of chicken cholera, for instance, produced general sepsis in the chicken, but a local abscess only in the guinea pig.

The virulence of the bacillus or its poison can be lowered in many ways; by high temperatures, partial desiccation, dilution by chemicals, or by culture of the original in different animals. Pasteur's experiments with the bacillus of anthrax were very numerous and efficacious. He produced cultures of lowered infectiousness and vaccinated sheep. It is true many died of the infection, but a great many were rendered immune, and the mortality from anthrax was very much reduced. Experiments made with the view of lowering the virulence of bacilli in other animals were also successful. That of hog erysipelas was thus changed when passing through the rabbit, and the poison of rabies, believed by Pasteur—though even he could not isolate it—to be the product of an organism, after unsatisfactory experiments with monkeys, was weakened by its passage through the same animal, viz.,

the rabbit. The indomitable man was successively engaged in finding new hypotheses based on well-known facts, and in experiments which were to prove or disprove the value of his hypotheses. In regard to rabies his reasoning was as follows: The long duration of its incubation proves the slow progress of the poison in the direction of the nerve centres, for it is of symptoms of the nerve centres that the patient infected by a mad dog finally dies. Thus the time between the infection and the affection of the nerve centre should be utilized by antitoxic injections. The poison must be intercepted. It is well known that the spinal cord of the rabbit is gradually and in proportion to the duration of its presence in the organ, changed by injection with fully virulent rabic poison, that the different degrees of morbid changes produced in its tissue yield a material which is employed for injection into the patient who has been, or is believed to have been infected. The attacks on this method, or rather its effects, are many, but it appears that the good done by it far outweighs its dangers or ill results. And one fact must never be forgotten: it is but little more than a decade since the method has first been employed. It has been the forerunner of other discoveries of similar import and of more and extensive utility. Thus it appears that the future therapy of infectious and contagious diseases will be built upon the foundation laid by the work performed in Pasteur's and other laboratories.

As far as Asiatic cholera is concerned, the discovery of the comma bacillus appears to have finally settled the question of its cause. The bacillus, however, does not enter the circulation, but destroys life by secreting a deadly poison. So does that of yellow fever; so does rabies, each with its own poison bred by its own specific bacillus. In these diseases it is not the weakened bacillus that can be expected to act as an antidote, but the lowered strength of the chemical poison. Thus it was that Ferran's therapeutical experiments with living cultures in 1885 were of doubtful importance. When cholera again appeared in 1890. Haffkin, of Russia, working in Pasteur's laboratory, found that cholera bacilli when cultured lose part of their activity. Imbued as he was with Pasteur's principles the light flashed upon him. The lowered activity of the culture bacilli could be expected to be utilized as the healing agent after having been tried on somebody. But animals are immune, so he made himself the object of experiment and, he did not die. Within two years afterwards, in the East Indies, he made 70,000 injections on 42,179 human beings in 98 different localities. No accident marred his operations, though pain followed each of them for four or five days. In order to control his experiments he always vaccinated a part of the population only. What were the results of his

laborious and self-sacrificing labors? In Calcutta the morbidity of those vaccinated fell to 1–19 or 1–24 compared with former experience; the mortality fell to 1–17 or 1–24. If in the near future—in Berlin they are experimenting at this moment on the action of dead cultures which appear to immunize — the methods will be improved, and the East Indian and Arabian pilgrims be vaccinated before they start for Mecca, "Death, where is thy sting! Grave, where is thy victory!"

As so much has been written on the subject of diphtheria, a few words may suffice on that form of this contagious and infectious disease which is caused by, or as some still say, accompanied with the Klebs-Loeffler bacillus. The bacillus locates on the mucous membrane of the naso-pharynx, sometimes on wounds. On the mucous membrane it produces a disease only when the surface is sore and thereby amenable to invasion. It does not enter the circulation, but produces a poison which is rapidly absorbed. When this chemical poison is injected into an animal in slowly increasing doses, which should be large enough to make sick but not to destroy, an antidote to the original disease is produced in the serum of that animal. This is the healing serum of Behring, which has succeeded in greatly reducing the mortality of diphtheria, and may be further proved to cause temporary immunity when injected into those who are well but constantly exposed. This almost fabulous result is the result exclusively of laboratory work. The success accomplished thus far speaks well for the future. It does not require an unbounded enthusiasm to believe that the results will be still more favorable in this dread disease which destroys the infants and children in every country by the ten thousands, and to trust that further study and experimental labors may find similar methods for the subjugation of other contagious and infectious diseases. The question of rabbit, sheep or horse rights ought not to be raised. We kill them and eat them to keep alive. In the laboratory we utilize them for the purpose of finding means to keep alive our people young and old, while but few, if any, are destroyed in the process. The problem will be to decide whether the future is to belong to the rabbit and sheep or to mankind.

All those results could not have been attained without experimentation on animals. The saving of animal and of human lives accomplished by its teaching is simply immense. Let us consider.

The investigation of the action of remedies can not be complete without it. Anthrax has lost its terrors amongst the French peasantry since Pasteur discovered how to reduce the mortality of their sheep. One of the most fearful calamities of former times, the terror of every woman who is to become a mother—childbed fever—has been reduced

to the very lowest figure wherever the teaching of animal experimentation has been heeded. Hydrophobia, fatal in every case, is now accessible to successful treatment. Myxœdema, an incurable disease a few years ago, has become curable in almost all instances, even cretinism in many. Tuberculosis may be, and is in part, confined within certain limits. The prevention of cholera is no longer a dream. The mortality of diphtheria has been reduced to one-half of what it was. The success of surgical operations under the influence of Listerism is simply marvellous; antisepsis and asepsis have been evolved out of the laborious studies of medical experts.

All these blessings, the enumeration of which has not exhausted the list, are the immediate results of experimentation on animals. To deny it is either ignorance or malevolence—mostly the former. In our times when nobody who is mortal can be acquaiated with everything worth knowing, it is no reproach to be ignorant of topics known only to those who make them their special study. There is, however, another class of people with whom there is no reasoning. As long as the law of the land allows them to be abroad, you can only rely on the better judgment of the majority. This majority will not defile the name of "Christianity" to cover moral obtuseness, and that of "science" to shield intellectual hebetude. Those who refuse sleep to the sick unto death in order that they may pray, and a remedy to those in pain and dying of an acute disease—I know whereof I speak—they all are antivivisectionists. But there are also thousands of antivivisectionists amongst the educated men and women, and the legislators of the land, all of them philanthropically inclined, who because they can not, ought not to judge of these things. All of them, when taken sick, confide their lives to the judgment of the physician, ask no question and offer no criticism; but all of them, as long as their interest is theoretical only, express, perhaps even have, positive opinions dictated by their hearts, and allow their easily won sympathies to run away with their signatures under an antivivisection proclamation. What is it that makes the best talents of the medical profession; those who are most bent upon the elevation of the standard of science and the improvement of mankind; the great men amongst practitioners; the teachers of physiology, biology, and hygiene, adherents to animal experimentation? What is it, if not its indispensability?

You say that hundreds of M. D.'s add their signatures to the applications for the abolition of animal experimentation. Still, you do not say that you know how easy it is to gather names, such as they are, on every sheet of paper which is not a check or a promise to pay. Unfortunately it is too easy; and if the public does not know, we in

the profession know that there are M. D.'s and M. D.'s. There are those who make a living out of their profession—a trade out of a vocation—witnout ever having the clouds removed from their brains, or from their hearts, or from their conciences either, by solid knowledge of any kind, or by sympathy or the sense of responsibility. Do you expect that the hundred thousand practitioners—not every M. D. is a physician—of the United States are of equal knowledge, morality, public spirit and self-sacrifice? In other spheres you do not count names, you weigh them. When you require an exalted opinion based on the laws of the land or of humanity, you select an expert. In great economic and political questions you ask statesmen, but not the wire-pulling ward politician. And in a question of science, of physiology and hygiene, you want us to believe that you abide by the name of any M. D. in some distant corner whose name you have never heard, never will hear! But there is a famous man on the other side of the Atlantic. Famous! Yes, for did he not cut more abdomens than any living man? He is an apostle of antivivisectionism! I do not stand here, however, to criticise methods of operating or of making out statistics. What I always do when I want to take the measure of a medical man is to consult the opinion of the best men in science and in morals of his country. His weight is taken.

Who believes, or makes believe, that there is no sympathy, love for the living, or regard for life in those whose profession is more than any other an arduous labor of love? Or who, not a medical man, will decide what means must be selected to increase knowledge, and as every knowledge has its practical results, to benefit mankind? Is there any antivivisectionist who would not on principle employ antitoxin if his child be stricken with diphtheria? Or a woman who would refuse preventive measures due to animal experimentation exclusively, in order to avoid her own death or that of the newly born waif? It is no use to call antivisectionists hard names. There is but one thing to do, namely, to appeal to their common sense, their duty to husband, wife, children. *Thus* it *has* come to pass that the English restrictive laws have been partly rescinded, and English medicine is thereby restored to the privileges of legitimate science. No prohibition of any kind ever worked well.

One of the objections to animal experimentation which we hear constantly from the lips of antivivisectionists is that the results of such procedures are unsatisfactory in as much as the struggles and the pain render the conclusions unequal and doubtful. That may be true to a certain extent, but as I have proved by facts, is not a barrier to the extension of our knowledge. To a certain extent it *is* true, however, and

some experiments can not be made without giving pain. But the light of science shines on animal as it does on man. Anæsthesia, which itself has not been developed without animal experimentation—and is it not a wondrous achievement?—has been a blessing to both man and animal. Under its influence there is no pain, no struggling, and less uncertainty as to the results of observation. Thus more humanity and more reliability go hand in hand. Nobody rejoices more intensely at that than the experimenter, for he can observe better, study better, and he need not himself suffer by giving pain to the helpless. Medical science and art were born out of the heart of man. The physical distress of man created love and helpfulness. It is not in the nature of things that the followers and apostles of medicine should be otherwise than thoughtful and sympathizing. This much I, who have been a close observer and a coworker of the medical profession of the state of New York these forty-three years, can say that I never knew of a medical man, practitioner or teacher, who was morally lowered by his practice or his scientific work. On the contrary, I find the old practitioner getting more cautious and sympathetic, and the pure scientist more considerate and circumspect from year to year. We are not angels, nor pretend to be in this life; but we do not forget, any more than any other heedful member of human and humane society, that "Though I speak with the tongues of men and of angels, and have not charity, I am become as sounding brass or a tinkling cymbal. And though I have the gift of prophesy and understand all mysteries, and all knowledge, and though I have all faith so that I can remove mountains, and have not charity, I am nothing."

It is to me a constant source of painful surprise to find men and women ever ready to attribute bad, selfish and cruel motives to others. Do they think the great experimenters had an easy life? If there is an occupation that strains every physical, moral and intellectual labor, it is that of the close student of nature. Nor is the study of nature unattended with danger. When a soldier dies in the very moment that he is bent upon inflicting death upon his adversary he may be rewarded with admiring songs and a lasting monument. Every physician, every scientist is constantly on his field of battle, and he may die on it. Obermeier was not the only one who, when studying the spirillum of relapsing fever by night and day, sacrificed his life. For him there is no visible monument. Only a few months ago the magazines reported the death of a young experimenter who was killed by his object of study.

Nor is the story I heard Dr. Playfair tell a few days ago on the occasion of the Boston semi-centennial celebration of anæsthesia less

instructive. He was the co-operator of Simpson, of Edinburg, during and after the time of the discovery of chloroform, and busily engaged in finding other anæsthetics. Some day Simpson called and asked for news. He was told of a new compound that certainly was a powerful anæsthetic, and insisted on trying it immediately upon himself. Playfair refused, but proposed to try it again on some rabbits. Simpson having consented, called the following day. Having been informed that some time ago the rabbits were alive, he insisted upon an immediate experiment upon himself, and hardly allowed the time required to inspect the rabbits. They were brought up—dead.

Without deliberating long after hearing the tale, I decided in my mind that the death of the rabbits was not after all such a calamity as that of Simpson would have proved. I will also admit that, as I said before, I was ever of the opinion that the present and the future ought rather to belong to man, and not to the same degree to Guinea pigs, rabbits and horses. If man, and sympathetic woman also, are permitted to hunt and kill animals because they are good to eat—man is not meant to be a cabbage eater exclusively—it is still more pardonable to experiment on them as humanely as possible for the purposes both of serving the commercial interests of the people and to preserve the health and save the lives of human beings exposed to fatal devastation by vegetable microbes.

There is, however, an admission which should be made to the anti-vivisectionists and to public opinion, no matter if it be the dictate of the heart only. There ought to be some restriction to animal experimentation. To permit every individual, inquisitive student or private person to operate indiscriminately on animals for the sake of personal curiosity, I personally do not approve of it. Whatever experimentation is not intended or able to elevate the human mind, is liable to impair it. Flimsiness and frivolousness must not claim the mantle of sacred science. I am not ready to admit that the sweet will or the thoughtless meddling of anybody who calls himself a medical student should be encouraged to do work will not lead to serious scientific conclusions. To experiment on the living with results leading to the improvement of science, and to benefit the art of preventing and healing diseases, takes thorough knowledge and high aims. Nor am I prepared to approve of indiscriminate lecture-room demonstrations on living animals before college classes of medical students and still less in public schools. They belong to laboratories, such as the intelligent generosity of a fellow citizen of yours has established for you. Here is all the mechanical and scientific skill, here are the facilities and preparatory studies required for the consummation of our aims and ends.

Here it is that such advanced students and graduates who have the skill and knowledge and ambition demanded of future teachers of science, and benefactors of mankind, may be instructed. The interests of human and humane science are amply guarded by some such restrictions as will confine animal experimentation to institutions specially calculated for such purposes. To them it may be confined. In them, however, it *should be protected*. And instead of being hampered by the intrusion of uninformed and jealous watchmen, as has been proposed, it should be treated with admiration and reverence. What the church and sanctuary are to the religious, what the hall of a library is to the student of history and science, that is the laboratory to the explorer of the mysteries of life, and to the teacher of those secrets the revelation of which is indispensable for the protection of mankind, and the enhancement of its felicity.

The solemnity of the occasion which affords me an opportunity to speak to you this evening, and the indulgence exhibited to me, encourage me to speak in connection with this laboratory of hygiene of a subject intimately connected with it. The Bender Labaratory of Hygiene as planned and established will have two objects, at least for the nearest future. I understand it is meant to be the place where systematic efforts will be made to increase, by new and original research, the stock of such knowledge as will prevent, wherever it will reach, the origin and dissemination of contagious and infections diseases. Its further destination in connection with the Medical College and its hospital is to furnish the means of an exact diagnosis of the cases entrusted to the painstaking care of the hospital physicians. From the standpoint of philosophy and humanity these two ends, it is true, belong together. The first is to benefit all humanity. The second includes the scientific labors calculated for the individual sick. It seems to me, however, that you will soon learn that the interests of science as a whole and those of the patients in your wards can be better served by separating them. Indeed, the laboratory of hygiene ought to labor exclusively in the service of the scientific and social community; the hospital in that of the individual man, woman and child. Laboratories like this new abode of science are but a few dozen years old. Within that short period many of the aspects and aims, not only of theory, but of practice have been changed. A modern hospital is as different from that but twenty-five years old as a comfortable, clean, ventilated, spacious, cozy and healthy house of yours differs from the lodge of the pioneer. He lived in it, but its barrenness and exposure are not the consumation of human civilization and cultured existence. Modern science means to make hospitals modern

institutions and succeeds in so doing. Whatever contributes to the comfort and welfare of the patient—ample space, light and food, all the resources of science—society places at the disposal of its wards. In this way hospitals have become a school. not only for the medical man, but for the public also. There is particularly one demand which ought to be fulfilled in every hospital.

There ought to be, there must be laboratory facilities in and directly connected with every modern hospital. It requires no demonstration that rational treatment is not possible without a correct and minute diagnosis. Blood, sputum, urine, fæces, stomach contents, tumors, eruptions, require a careful examination. There is scarcely a case nowadays that does not require some one examination of the kind. Nor is it enough in blood diseases, for instance, to count cells, compare red cells and leucocytes. These very leucocytes assume different characters and undergo the most various changes. The indistinct class of fevers which tempt so much to call them malaria, perhaps because the mellifluous and foreign sounding word is relished by the people, require for diagnosis examination for plasmodium, or the bacterium coli commune or streptococcus. The cases in which neither was found, but an encephalitis explained all the symptoms, are not rare within my own experience.

The examination for tubercle bacilli facilitates the diagnosis of the true nature of peritonitis which may depend on appendicitis, tuberculosis, carcinoma, or the invasion of the bacterium coli commune, pneumococcus, or streptococcus. The very diarrhœa of the child is far from being always catarrhal or the reflex of external exposure and irritation. It is mostly the result of the bacterium lactogenes, or coli commune, or a hay bacillus. The very selection of the milk food is a matter of grave responsibility which often can be shouldered only by a person equipped for microscopical and bacteriological examination. The latter is by no means so simple as it was thought to be when knowledge was less and faith greater. It is not more than a dozen years ago that a gentleman who admired his universal standing as a microscopist told me that he disdained the use of stains, for what he could not see without dyeing and understand, did not exist. Now he is staining.

The labor connected with every single hospital case has greatly increased with the accumulation of new knowledge. Even a layman uninstructed in medical matters, appreciates that difficulties grow with results, results with difficulties. So the best achievements of a hospital require from year to year more facilities, because they demand more work. Without the former, the latter remains sterile. The faithful

blending of practical labor and scientific research finds no better illustration than a thoroughly modern hospital with a clinical laboratory attached. What I mean to suggest, in your case, is that in no distant future the hospital work ought to be performed not only in the sick wards, but also in a clinical laboratory immediately connected with them. All scientific work, however, unconnected with a special case, unless its interest and importance be of unusual magnitude, ought to be delegated to this new institution.

The necessity of equipping a hospital with all that is required by the laws of hygiene and the demands of scientific diagnosis concerns not alone the individual patient or the attending physician. It reaches further. By facilitating research, it adds to common knowledge and improves the chances of not only the patient, but of the future patients and doctors. Indeed, every such hospital is a school for the medical profession at large and at the same time a benefit to the community. Are there short-sighted objections? O, yes! Our fathers did without all this. The hospital was considered good as it was only ten or twenty years ago. Our old doctors were good doctors and a blessing to the community, and learned men. I say *Amen.* It is true there were no better men than Marsh, and Vanderpool, and Thomas Hun. Certainly their names are always mentioned when the best are recalled. But as they were learned, and conscientious, and eager and as good citizens as they were great doctors, they would stand by us as they often did, in our fights for better schools, better hospitals, more and better institutions, and more facilities to learn and to teach. They, one and all, would look about in the advanced and advancing state of science and practice, for a new hospital for the sake both of the community and the college which is to furnish medical advisers to the families of the country, and the future teachers. The example given by your sympathizing, enlightened, and public spirited fellow citizen, whose name I need not mention as it is in every heart and upon every lip, should be, will be, an incentive to others whose hearts are taught by their brains, whose brains are warmed by their hearts to give you and the city a well equipped, competent new hospital.

Spanish Losses in Cuba.—It is estimated in Madrid that since the beginning of the Cuban revolution, the army of occupation has lost nearly fifty thousand men, of whom by far the greater number died from disease. The total number of patients in the military hospitals in one day recently was 9,475, of whom 1,035 were suffering from yellow fever, 1,331 from malaria, and 520 from wounds.—*Medical Record.*